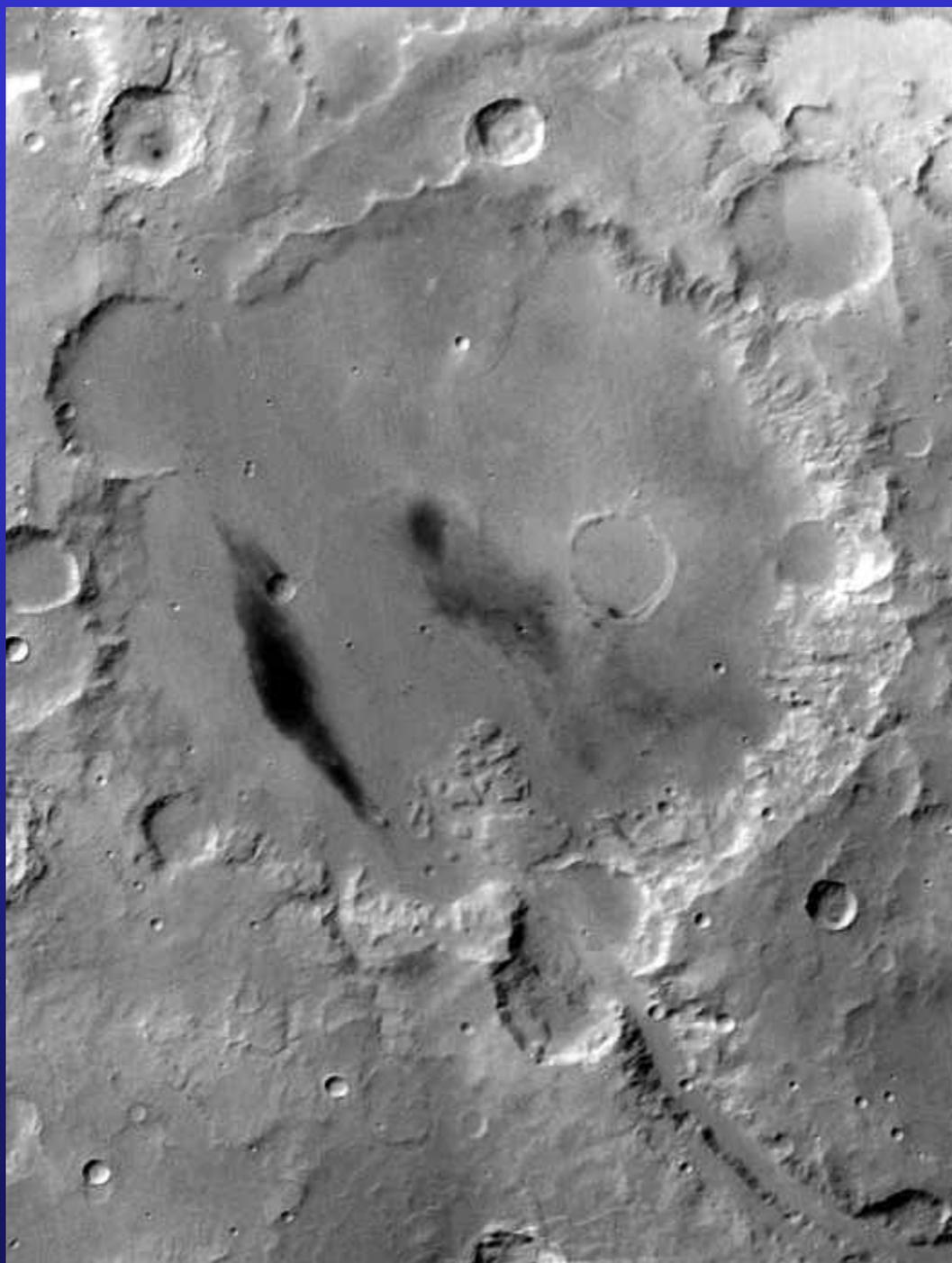


Geologic Units In Gusev Crater

Ross Irwin

Center for Earth and Planetary Studies
National Air and Space Museum
Smithsonian Institution

4th MER Landing Site Workshop
January 9, 2003

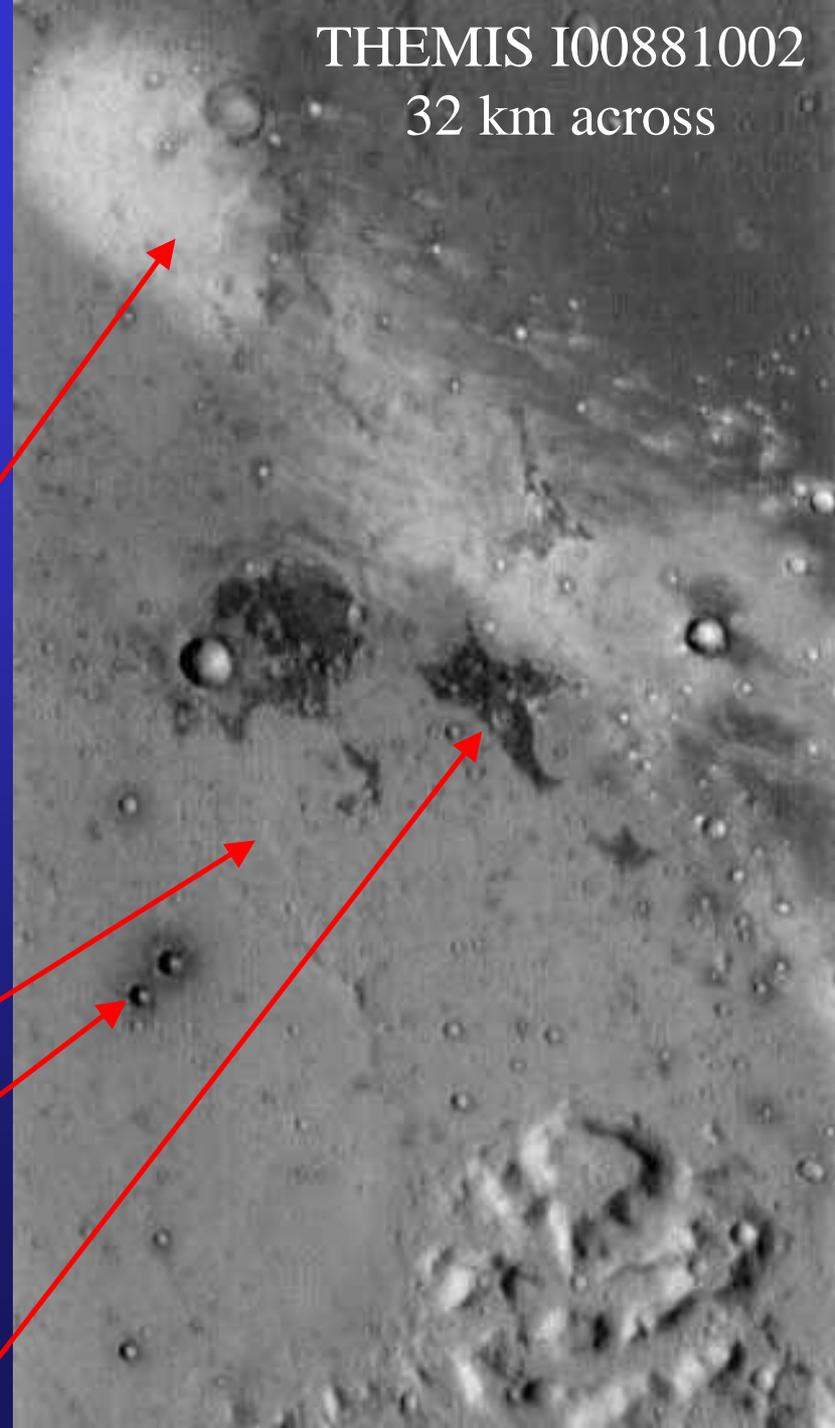
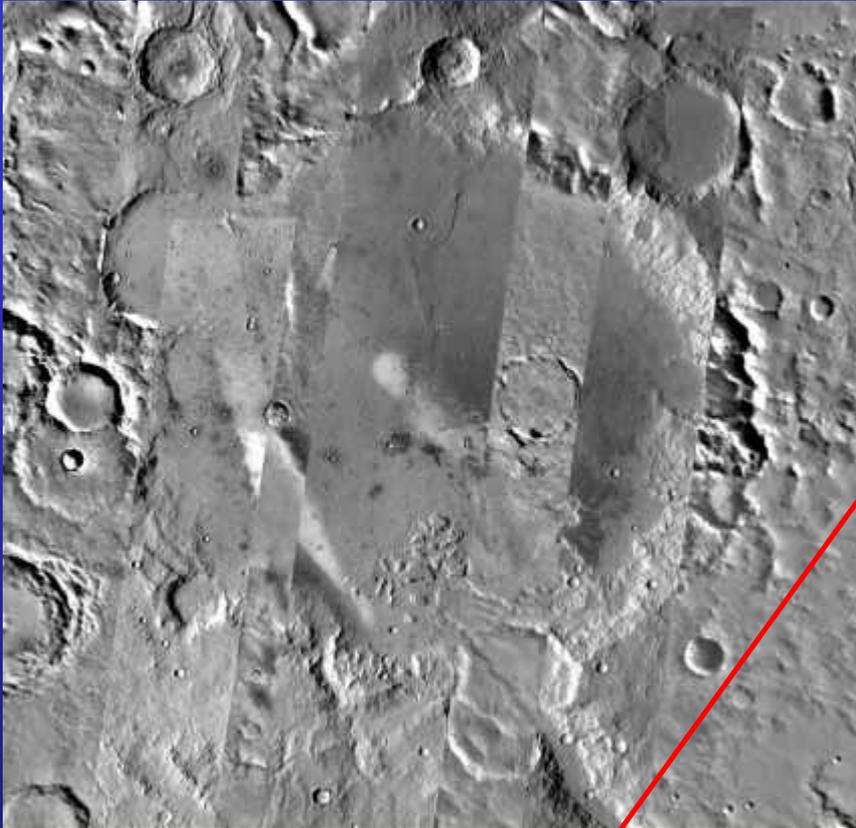


Daytime IR contrasts

THEMIS I00881002

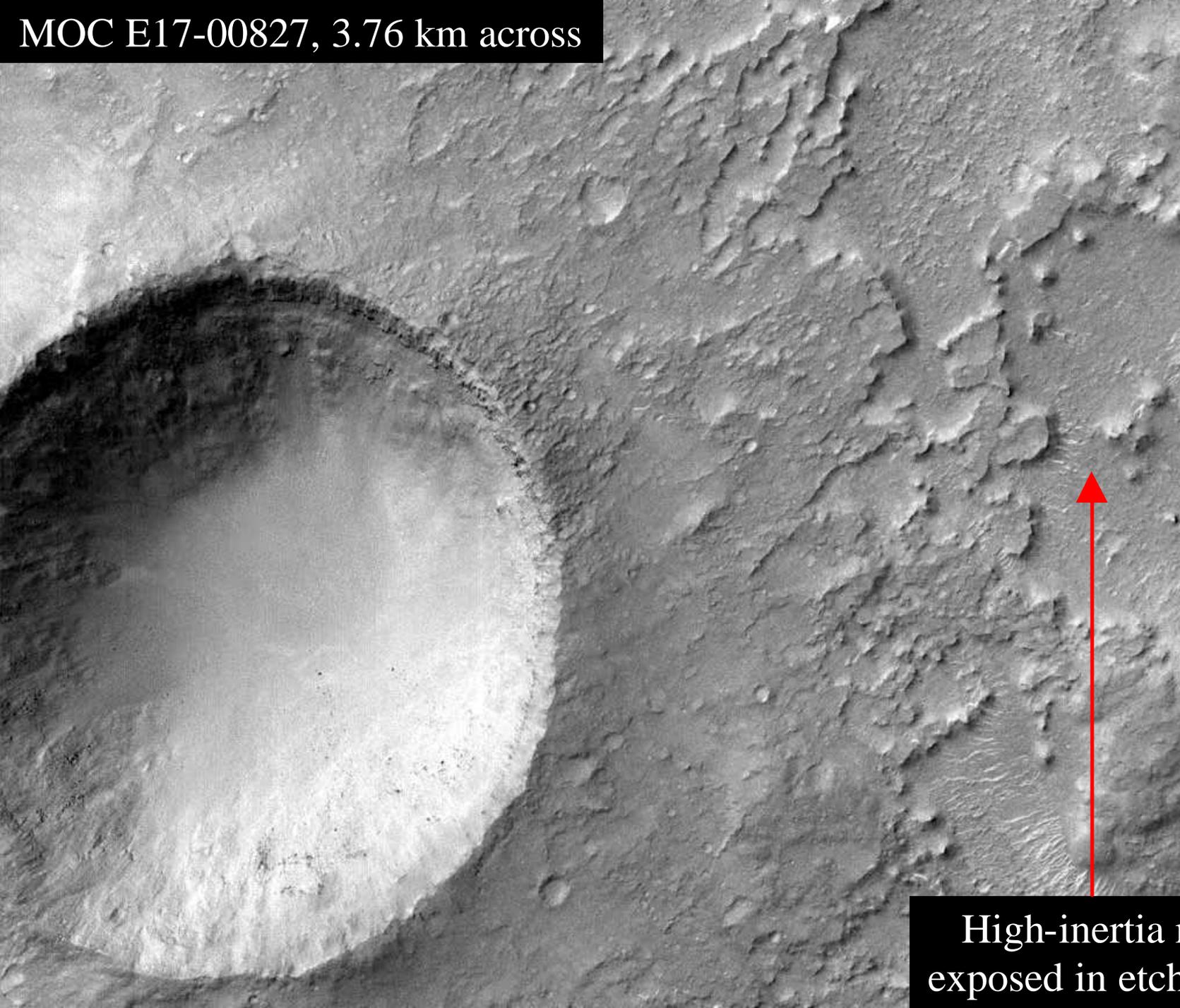
32 km across

MDIM/Daytime THEMIS



- Dust devil tracks
- Gardened crater floor
- Ejecta of larger craters
- Etched areas

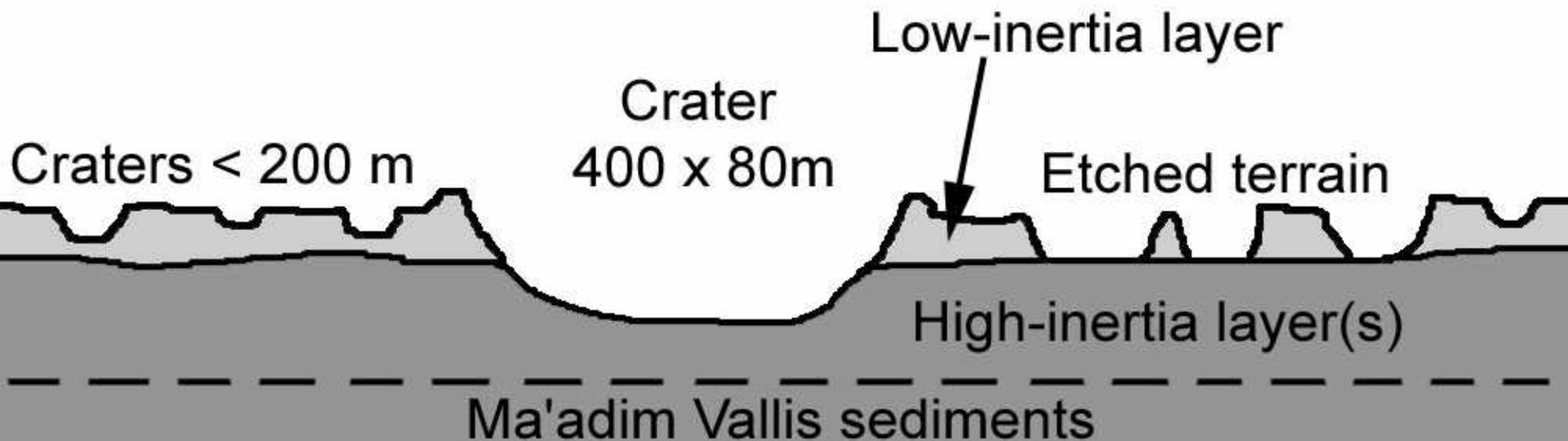
MOC E17-00827, 3.76 km across



High-inertia material
exposed in etched terrain

GUSEV CRATER STRATIGRAPHY

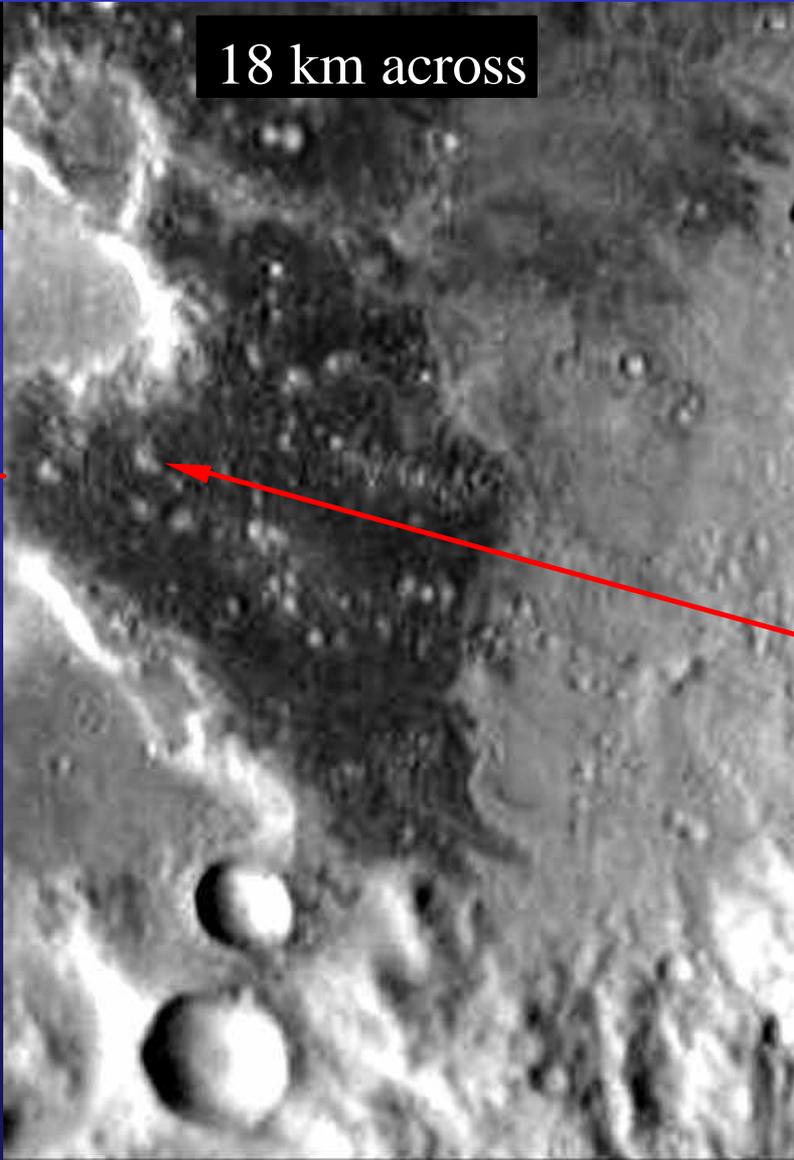
- Duricrust or cap layer in low-inertia material; composed of or mantled by fine sediments
- Low-inertia layer, gardened and etched
- High-inertia layer(s) in ejecta and etched terrain
- ~1 km Ma'adim deposit beneath surface layers



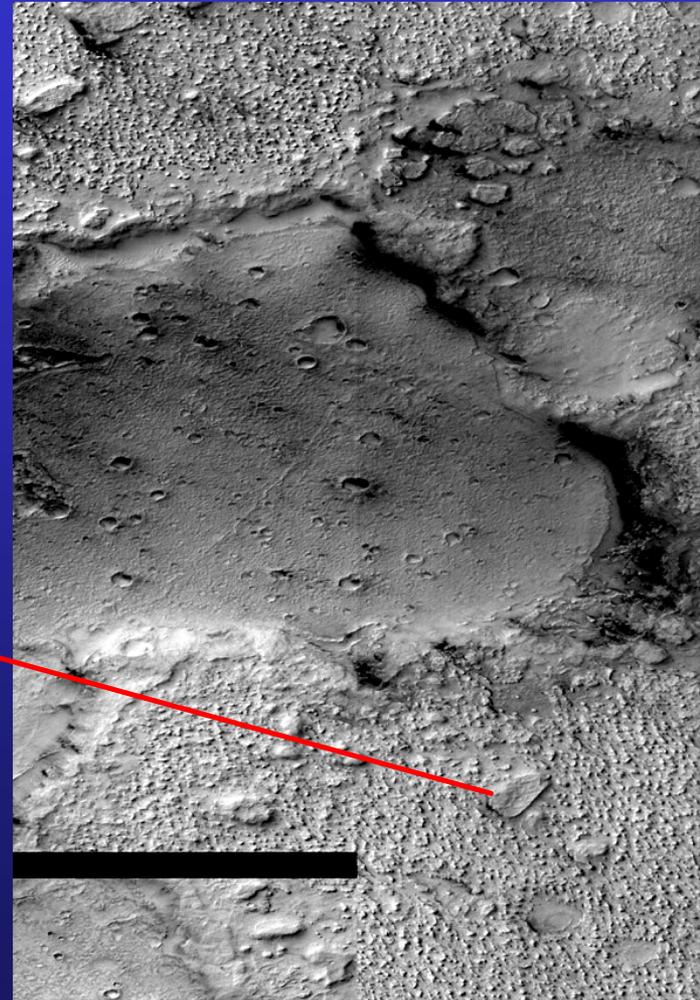
CONTRASTS BETWEEN COARSE AND FINE LAYERS



THEMIS IR
I00856001
32 km across



18 km across



MOC E02-00665 and E03-01511, 5.8 km across

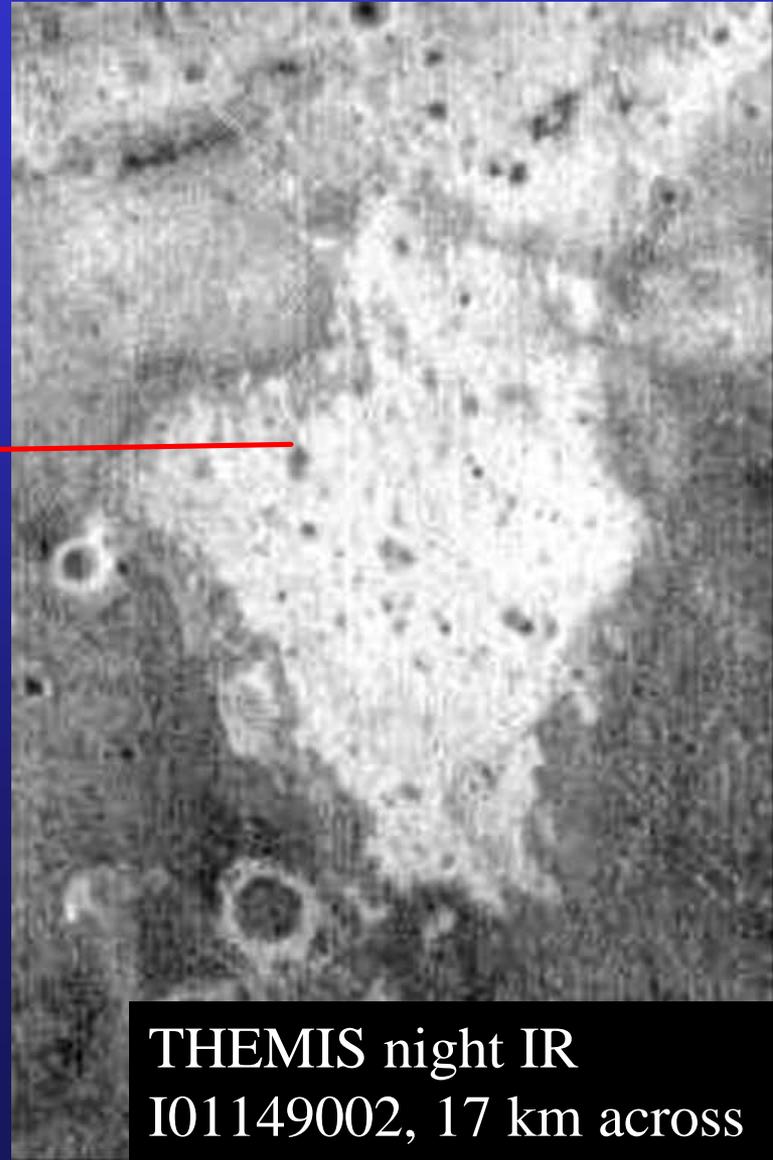
Etched terrain IR contrasts are due to material differences, not illumination



THEMIS IR
I00856001
32 km across



18 km across



THEMIS night IR
I01149002, 17 km across

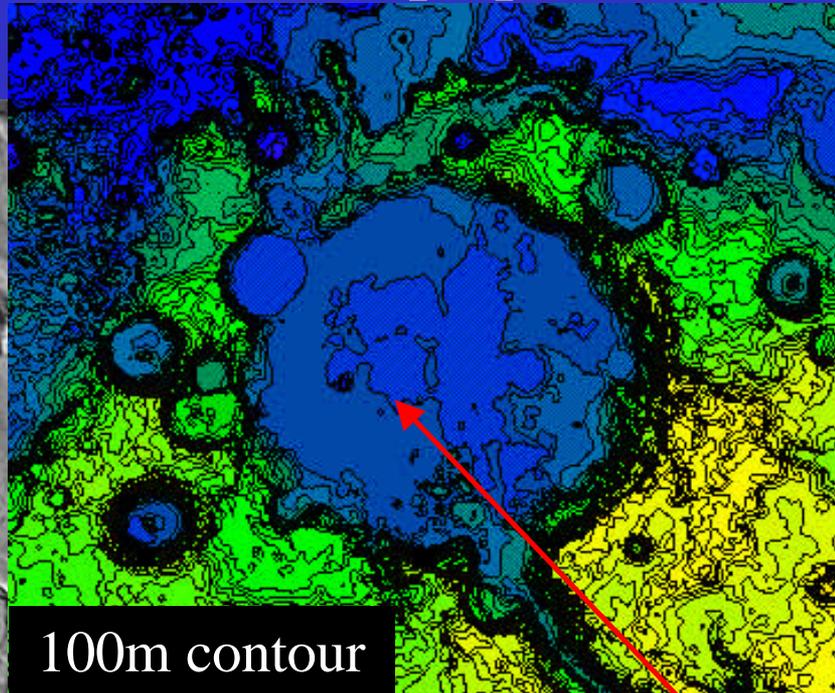
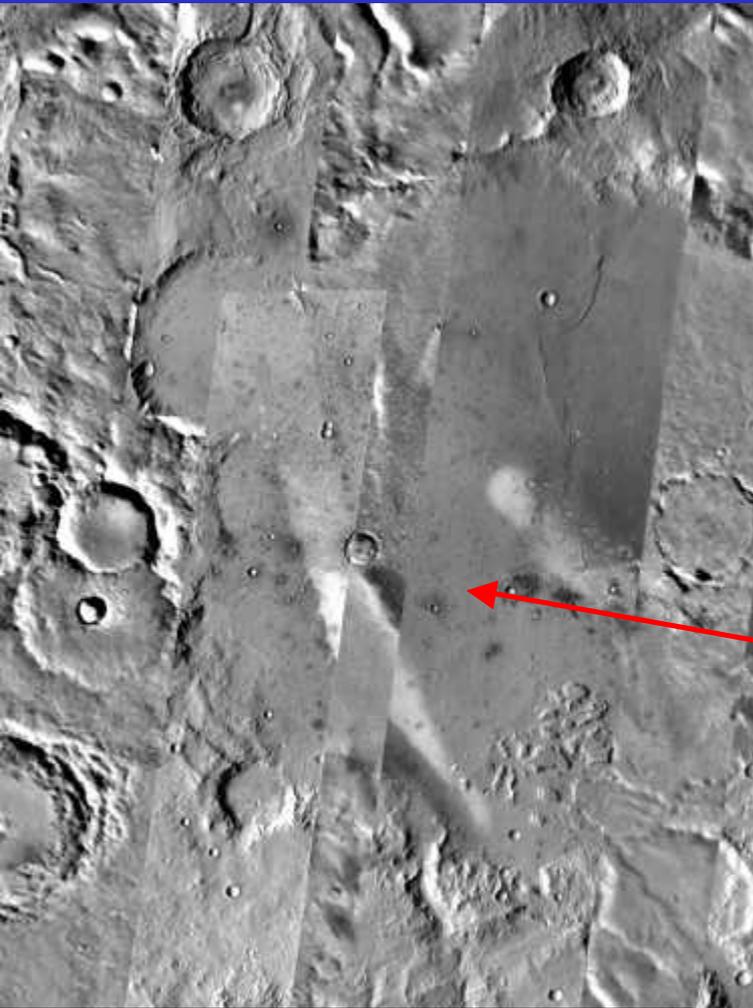
DURICRUST OR CAP LAYER

- Crater fill preserved as positive relief
- Sharp transition to gardened plains
- Isolated mesas
- Some elongation but L:W of knobs $< 4:1$

MOC E05-00471, 3 km across

IMPACT GARDENING

Fill of interior craters has lower populations



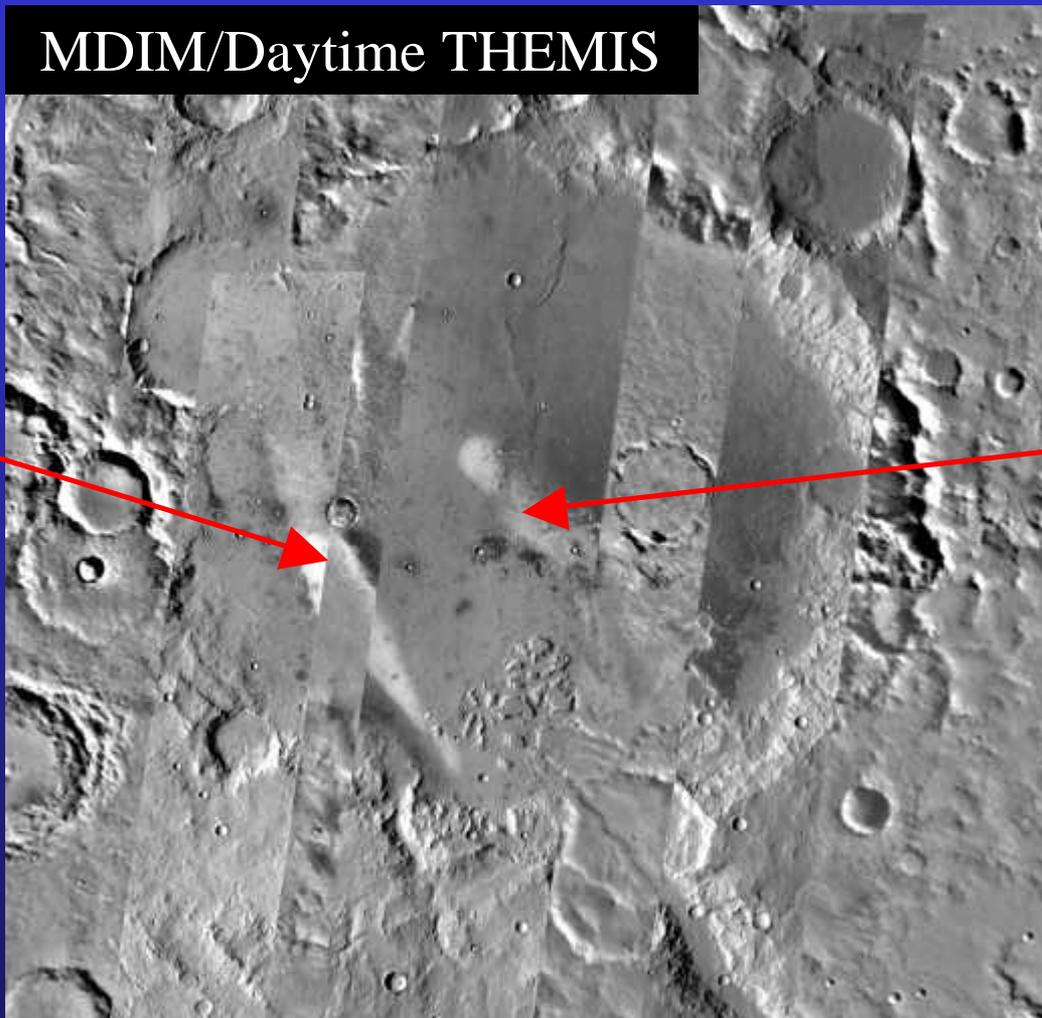
100m contour

MOC NA
E18-00950
3.5 km
across

MDIM/Daytime THEMIS

DUST DEVIL TRACKS

MDIM/Daytime THEMIS



MOC E10-02768
3 km across

MOC E15-00362
3 km across

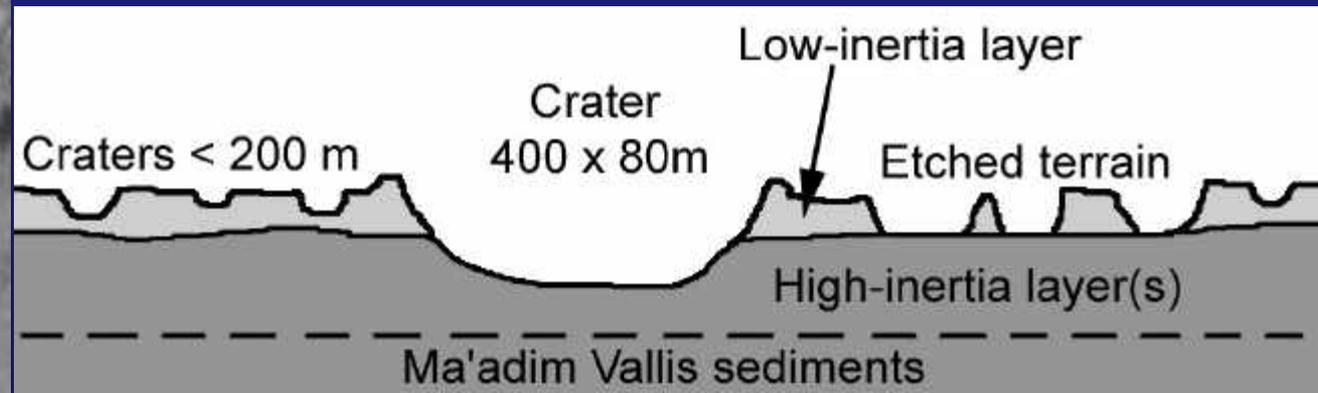
TESTABLE HYPOTHESES: Coarse layer

Exposure within the landing ellipse is limited; most common exposures are in crater ejecta

- Composition, size, sorting, rounding? Could be fluvial deposit from Ma'adim, intracrater fluvial deposit, duricrust, or volcanic material. Magnetic?



Use imagers, APXS, Mini-TES

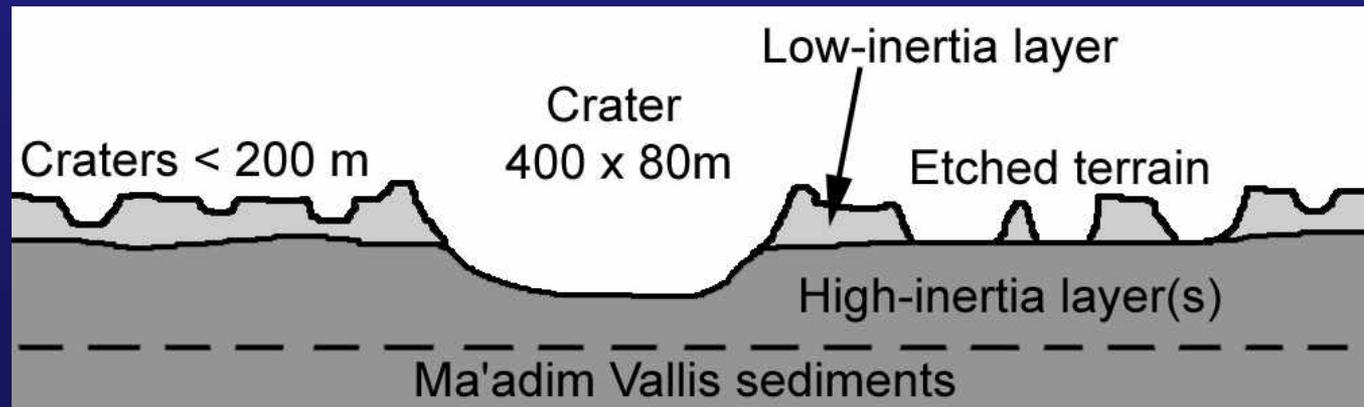


TESTABLE HYPOTHESES: Fine layer

*Extensive within the landing ellipse & ejecta
of small craters*

- Composition, size, sorting, rounding? Scale of layering? Crossbeds? Vertical sorting? Could be varves, pyroclastic, other airfall
- Use imagers, APXS, Mini-TES

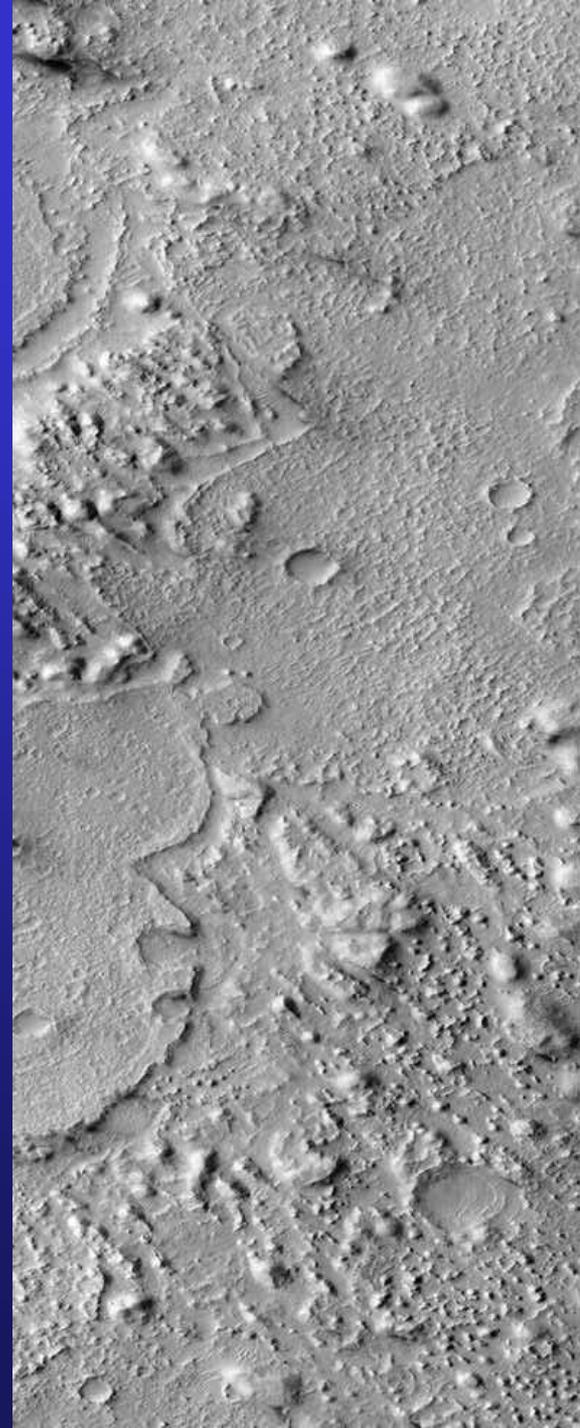
MOC
E17-00827,
3.76 km
across



TESTABLE HYPOTHESES: Duricrust (?) and dust devils

*Presumably extensive within the
landing ellipse*

- Are dust devils transporting a lag material? If so, what is its composition, size, etc.? What material is being exposed in the tracks?
- What cement is responsible for crust (if any)? Strength properties (RAT): how well cemented?



TESTABLE HYPOTHESES: Weathering

- Studies of weathering on Mars have remained largely theoretical. If fluvial or lacustrine deposits are identified, are they chemically altered or the products of physical weathering and rapid transport? This has implications for paleoclimate. Is active physical or chemical weathering observed?
- Use Mini-TES, APXS, and Mossbauer for sediment composition information

MOC E05-01183

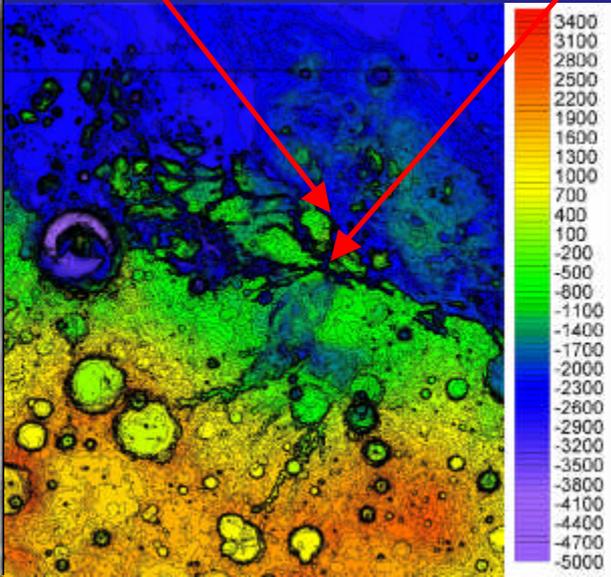
3 km across

ANALOG STUDIES

Dichotomy
boundary
sediments

MOC E10-02784

3 km across



THEMIS I00957001

32 km across